

CLAIMS

What is claimed is:

- 5 1. A computer audio system comprises:

an audio codec operably coupled to receive audio information and to provide a first stereo audio output, a second stereo audio output, and a monotone audio output based on the audio information; and

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a tone controller operably coupled to the audio codec, wherein the tone controller includes:

15 a low pass filter operably coupled to filter the monotone audio output, wherein the low pass filter passes a bass component of the monotone audio output substantially unattenuated and attenuates higher frequency components of the monotone audio output;

20 a high pass filter operably coupled to filter the first stereo audio output, wherein the high passes filter passes a treble component of the first stereo audio output substantially unattenuated and attenuates lower frequency components of the first stereo audio signal;

25 a band pass filter operably coupled to filter the second stereo audio output, wherein the band pass filter passes a mid band component of the second audio output substantially unattenuated and attenuates low frequency components and high frequency components of the second stereo audio signal; and

30 a summing module operably coupled to sum the bass component, the treble component, and the mid band component to produce a tone controlled audio output.

2. The computer audio system of claim 1, wherein the audio codec further comprises:

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a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio output based on the first stereo volume setting;

a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio output based on a second stereo volume setting of the audio information;

a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio output based on the second stereo volume setting; and

a monotone volume controller operably coupled to adjust volume of the monotone audio output based on a monotone volume setting of the audio information, wherein adjustments of the monotone volume setting adjusts the bass component of the tone controlled audio output, wherein adjustments to the first stereo volume setting adjusts the treble component of the tone controlled audio output, and wherein adjustments to the second stereo volume setting adjusts the mid band component of the tone controlled audio output.

3. The computer audio system of claim 1, wherein the audio codec further comprises:

a register for storing bass control settings and treble control settings, wherein the bass and treble control settings are included in the audio information;

a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio output based on the treble control settings;

a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio output based on the treble control settings;

a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio output based on a second stereo volume setting of the audio information;

5 a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio output based on the second stereo volume setting; and

a monotone volume controller operably coupled to adjust volume of the monotone audio output based on the bass control settings.

10 4. The computer audio system of claim 1, wherein the audio codec further comprises:

a register for storing bass control settings and treble control settings, wherein the bass and treble control settings are included in the audio information;

15 a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio output based on the treble control settings and a first stereo volume setting of the audio information;

20 a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio output based on the treble control settings and the first stereo volume setting;

a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio output based on a second stereo volume setting of the audio information;

25 a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio output based on the second stereo volume setting; and

a monotone volume controller operably coupled to adjust volume of the monotone audio output based on the bass control settings and a monotone volume setting of the audio information.

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5. The computer audio system of claim 1, wherein at least one of the low pass filter, the high pass filter, and the band pass filter further comprise a frequency response customized based on parameters of a computer including the computer audio system.
6. The computer audio system of claim 1, wherein the summing module further comprises an operational amplifier having a first input, a second input, and an output, wherein the first input is operably coupled to a reference voltage and the second input is operably coupled to sum the bass component, the treble component, and the mid band component.

7. A computer audio system comprises:

an audio codec operably coupled to receive audio information and to provide a first stereo audio output and a second stereo audio output based on the audio information;

a tone controller operably coupled to the audio codec, wherein the tone controller includes:

a notch filter operably coupled to filter the first stereo audio output, wherein the notch filter passes a bass component and a treble component of the first stereo audio output and attenuates a mid-band component of the first stereo audio output to produce a notched audio output;

a band pass filter operably coupled to filter the second stereo audio output, wherein the band pass filter passes a mid-band component of the second stereo audio output and attenuates a bass component and a treble component of the second stereo audio output to produce a band pass audio output; and

a summing module operably coupled to sum the notched audio output and the band pass audio output to produce a tone controlled audio output.

8. The computer audio system of claim 7, wherein the audio codec further comprises:

a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio output based on a first stereo volume setting of the audio information;

a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio output based on the first stereo volume setting;

a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio output based on a second stereo volume setting of the audio information; and

a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio output based on the second stereo volume setting, wherein adjustments to the first stereo volume setting adjusts bass and treble components of the tone controlled audio output, and wherein adjustments to the second stereo volume setting adjusts the band pass component of the tone controlled audio output.

9. The computer audio system of claim 7, wherein the audio codec further comprises:

a register for storing tone control settings that is included in the audio information;

a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio output based on the tone control settings;

a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio output based on the tone control settings;

a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio output based on a second stereo volume setting of the audio information; and

a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio output based on the second stereo volume setting.

10. The computer audio system of claim 7, wherein at least one of the notch filter and the band pass filter further comprise a frequency response customized based on parameters of a computer including the computer audio system.

11. The computer audio system of claim 7, wherein the summing module further comprises an operational amplifier having a first input, a second input, and an output, wherein the first input is operably coupled to a reference voltage and the second input is operably coupled to sum the bass component, the treble component, and the mid band component.

12. An audio codec comprises:

an input for receiving audio information;

5 audio processing circuitry operably coupled to produce a first stereo audio signal, a second stereo audio signal, and a monotone audio signal based on the audio information;

10 a low pass filter operably coupled to filter the monotone audio output, wherein the low pass filter passes a bass component of the monotone audio signal substantially unattenuated and attenuates higher frequency components of the monotone audio signal;

15 a high pass filter operably coupled to filter the first stereo audio output, wherein the high passes filter passes a treble component of the first stereo audio signal substantially unattenuated and attenuates lower frequency components of the first stereo audio signal;

20 a band pass filter operably coupled to filter the second stereo audio output, wherein the band pass filter passes a mid band component of the second audio signal substantially unattenuated and attenuates low frequency components and high frequency components of the second stereo audio signal; and

a summing module operably coupled to sum the bass component, the treble component, and the mid band component to produce a tone controlled audio output.

13. The audio codec of claim 12 further comprises:

25 a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio signal based on a first stereo volume setting of the audio information;

30 a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio signal based on the first stereo volume setting;

a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio signal based on a second stereo volume setting of the audio information;

- 5 a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio signal based on the second stereo volume setting; and

a monotone volume controller operably coupled to adjust volume of the monotone audio signal based on a monotone volume setting of the audio information, wherein adjustments of the monotone volume setting adjusts the bass component of the tone controlled audio output, wherein adjustments to the first stereo volume setting adjusts the treble component of the tone controlled audio output, and wherein adjustments to the second stereo volume setting adjusts the mid band component of the tone controlled audio output.

10 14. The audio codec of claim 12 further comprises:

a register for storing bass control settings and treble control settings, wherein the bass and treble control settings are included in the audio information;

20 a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio signal based on the treble control settings;

a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio signal based on the treble control settings;

25 a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio signal based on a second stereo volume setting of the audio information;

30 a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio signal based on the second stereo volume setting; and

a monotone volume controller operably coupled to adjust volume of the monotone audio signal based on the bass control settings.

5 15. The audio codec of claim 12 further comprises:

a register for storing bass control settings and treble control settings, wherein the bass and treble control settings are included in the audio information;

10 a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio signal based on the treble control settings and a first stereo volume setting of the audio information;

15 a right channel volume controller operably coupled to adjust volume of right channel of the first stereo audio signal based on the treble control settings and the first stereo volume setting;

20 a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio signal based on a second stereo volume setting of the audio information;

25 a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio signal based on the second stereo volume setting; and

a monotone volume controller operably coupled to adjust volume of the monotone audio signal based on the bass control settings and a monotone volume setting of the audio information.

16. The audio codec of claim 12, wherein at least one of the low pass filter, the high pass filter, and the band pass filter further comprise a frequency response customized based on parameters of a sound system including the audio codec.

17. The audio codec of claim 12, wherein the summing module further comprises an operational amplifier having a first input, a second input, and an output, wherein the first input is operably coupled to a reference voltage and the second input is operably coupled to sum the bass component, the treble component, and the mid band component.

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18. An audio codec comprises:

an input for receiving audio information;

5 audio processing circuitry operably coupled to produce a first stereo audio signal and a second stereo audio signal based on the audio information;

10 a notch filter operably coupled to filter the first stereo audio signal, wherein the notch filter passes a bass component and a treble component of the first stereo audio signal and attenuates a mid-band component of the first stereo audio signal to produce a notched audio output;

15 a band pass filter operably coupled to filter the second stereo audio signal, wherein the band pass filter passes a mid-band component of the second stereo audio signal and attenuates a bass component and a treble component of the second stereo audio signal to produce a band pass audio output; and

a summing module operably coupled to sum the notched audio output and the band pass audio output to produce a tone controlled audio output.

20 19. The audio codec of claim 18 further comprises:

a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio signal based on a first stereo volume setting of the audio information;

25 a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio signal based on the first stereo volume setting;

a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio signal based on a second stereo volume setting of the audio information; and

a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio signal based on the second stereo volume setting, wherein adjustments to the first stereo volume setting adjusts bass and treble components of the tone controlled audio output, and wherein adjustments to the second stereo volume setting adjusts the band pass component of the tone controlled audio output.

20. The audio codec of claim 18 further comprises:

a register for storing tone control settings that is included in the audio information;

a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio signal based on the tone control settings;

a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio signal based on the tone control settings;

a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio signal based on a second stereo volume setting of the audio information; and

a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio signal based on the second stereo volume setting.

21. The audio codec of claim 18, wherein at least one of the notch filter and the band pass filter further comprise a frequency response customized based on parameters of a sound system including the audio codec.

22. The audio codec of claim 18, wherein the summing module further comprises an operational amplifier having a first input, a second input, and an output, wherein the first input is operably coupled to a reference voltage and the second input is operably coupled to sum the bass component, the treble component, and the mid band component.

23. A computer audio system comprises:

an audio codec operably coupled to receive audio information and to provide a first stereo audio output, a second stereo audio output, and a monotone audio output based on the audio information;
5 and

a tone controller operably coupled to receive the first stereo audio output, the second stereo audio output, and the monotone audio output and produces therefrom an audio output, wherein the tone controller includes at least one of:

10 a low pass filter operably coupled to filter the monotone audio output, wherein the low pass filter passes a bass component of the monotone audio output substantially unattenuated and attenuates higher frequency components of the monotone audio output;

15 a filter operably coupled to filter at least one of the first stereo audio output and the second stereo audio output, wherein the filter passes at least one component of the at least one of the first stereo audio output and the second stereo audio output substantially unattenuated and attenuates other components of the at least one of the first stereo audio output and the second stereo audio output; and

20 a band pass filter operably coupled to filter the second stereo audio output, wherein the band pass filter passes a mid band component of the second audio output substantially unattenuated and attenuates low frequency components and high frequency components of the second stereo audio signal.

25 24. The computer audio system of claim 23, wherein the audio codec further comprises:

a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio output based on a first stereo volume setting of the audio information;

a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio output based on the first stereo volume setting;

5 a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio output based on a second stereo volume setting of the audio information;

a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio output based on the second stereo volume setting; and

10 a monotone volume controller operably coupled to adjust volume of the monotone audio output based on a monotone volume setting of the audio information, wherein adjustments of the monotone volume setting adjusts the bass component of the tone controlled audio output, wherein adjustments to the first stereo volume setting adjusts the treble component of the tone controlled audio output, and wherein adjustments to the second stereo volume setting adjusts the mid band component of the tone controlled audio output.

25. The computer audio system of claim 23, wherein the audio codec further comprises:

20 a register for storing bass control settings and treble control settings, wherein the bass and treble control settings are included in the audio information;

a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio output based on the treble control settings;

25 a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio output based on the treble control settings;

a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio output based on a second stereo volume setting of the audio information;

a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio output based on the second stereo volume setting; and

5 a monotone volume controller operably coupled to adjust volume of the monotone audio output based on the bass control settings.

26. The computer audio system of claim 23, wherein the audio codec further comprises:

10 a register for storing bass control settings and treble control settings, wherein the bass and treble control settings are included in the audio information;

15 a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio output based on the treble control settings and a first stereo volume setting of the audio information;

20 a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio output based on the treble control settings and the first stereo volume setting;

25 a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio output based on a second stereo volume setting of the audio information;

a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio output based on the second stereo volume setting; and

30 a monotone volume controller operably coupled to adjust volume of the monotone audio output based on the bass control settings and a monotone volume setting of the audio information.

27. An audio codec comprises:

an input for receiving audio information;

5 audio processing circuitry operably coupled to produce a first stereo audio signal, a second stereo audio signal, and a monotone audio output based on the audio information, wherein the audio processing circuitry processes the first stereo audio signal, the second stereo audio signal, and the monotone audio signal to produce an audio output, wherein the audio processing circuitry includes at least one of:

10 a low pass filter operably coupled to filter the monotone audio output, wherein the low pass filter passes a bass component of the monotone audio output substantially unattenuated and attenuates higher frequency components of the monotone audio output;

15 a filter operably coupled to filter at least one of the first stereo audio output and the second stereo audio output, wherein the filter passes at least one component of the at least one of the first stereo audio output and the second stereo audio output substantially unattenuated and attenuates other components of the at least one of the first stereo audio output and the second stereo audio output; and

20 a band pass filter operably coupled to filter the second stereo audio output, wherein the band pass filter passes a mid band component of the second audio output substantially unattenuated and attenuates low frequency components and high frequency components of the second stereo audio signal.

25 28. The audio of claim 27, wherein the audio codec further comprises:

a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio output based on a first stereo volume setting of the audio information;

a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio output based on the first stereo volume setting;

5 a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio output based on a second stereo volume setting of the audio information;

a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio output based on the second stereo volume setting; and

10 a monotone volume controller operably coupled to adjust volume of the monotone audio output based on a monotone volume setting of the audio information, wherein adjustments of the monotone volume setting adjusts the bass component of the tone controlled audio output, wherein adjustments to the first stereo volume setting adjusts the treble component of the tone controlled audio output, and wherein adjustments to the second stereo volume setting adjusts the mid band component of the tone controlled audio output.

15 29. The audio of claim 27, wherein the audio codec further comprises:

20 a register for storing bass control settings and treble control settings, wherein the bass and treble control settings are included in the audio information;

a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio output based on the treble control settings;

25 a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio output based on the treble control settings;

a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio output based on a second stereo volume setting of the audio information;

a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio output based on the second stereo volume setting; and

5 a monotone volume controller operably coupled to adjust volume of the monotone audio output based on the bass control settings.

30. The computer audio system of claim 27, wherein the audio codec further comprises:

10 a register for storing bass control settings and treble control settings, wherein the bass and treble control settings are included in the audio information;

15 a left channel volume controller operably coupled to adjust volume of a left channel of the first stereo audio output based on the treble control settings and a first stereo volume setting of the audio information;

20 a right channel volume controller operably coupled to adjust volume of a right channel of the first stereo audio output based on the treble control settings and the first stereo volume setting;

25 a left channel volume controller operably coupled to adjust volume of a left channel of the second stereo audio output based on a second stereo volume setting of the audio information;

a right channel volume controller operably coupled to adjust volume of a right channel of the second stereo audio output based on the second stereo volume setting; and

30 a monotone volume controller operably coupled to adjust volume of the monotone audio output based on the bass control settings and a monotone volume setting of the audio information.